



# Abusive Head Trauma: A New Name for Shaken Baby Syndrome

**One (1.0) Contact Hour**

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## **Purpose & Objectives**

The purpose of this course is to provide healthcare professionals with information about Abusive Head Trauma.

### ***After successful completion of this course, you will be able to:***

1. Define abusive head trauma.
2. Delineate the most common injuries associated with abusive head trauma.
3. Describe predisposing factors and causes of abusive head trauma.
4. Compare diagnostic tests used to confirm a diagnosis of abusive head trauma.
5. Describe ways to prevent abusive head trauma

## **Introduction**

Abusive head trauma (AHT), formerly known as shaken baby syndrome, is a violent injury to the head caused by shaking, blunt impact, suffocation, or strangulation (American Academy of Pediatrics [AAP], 2013). Approximately 20/100,000 children sustain AHT (AAP, 2015).

AHT is the most common cause of death in children during the first year of life (Paul & Adamo, 2014).

Small children are particularly vulnerable to such abuse because of the large disparity in size between them and an adult-sized perpetrator.

Therefore, it is imperative that all clinicians learn the signs and symptoms of abusive head injury.

## **Epidemiology of Abusive Head Trauma**

Head injuries are the leading cause of traumatic death and the leading cause of child abuse fatalities (Paul & Adamo, 2014). Serious injuries in infants, particularly those that result in death, are rarely accidental unless there is another clear explanation, such as trauma from a motor vehicle crash.

AHT is unlikely to be an isolated event. Evidence of prior child abuse is common; in a study of 173 children with AHT, 54 were not recognized as having been abused on initial presentation. Fifteen of these children were subsequently re-injured after the missed diagnosis and four of these children died (Paul & Adamo, 2014).

Per the US Department of Health and Human Resources, 2.07 per 100,000 children died from child abuse in 2010. According to the Centers for Disease Control (CDC), 25% to 30% of children with AHT die, and only 15% survive without any sequelae (Paul & Adamo, 2014).

## What is AHT?

In 2009, the American Academy of Pediatrics (AAP) recommended that clinicians use the term “abusive head trauma” instead of shaken baby syndrome, inflicted traumatic brain injury, and non-accidental head injury. These terms have all been used in the literature to describe AHT (AAP, 2013 & Paul & Adamo, 2014).

“AHT is a well-recognized constellation of brain injuries caused by the direct application of force to an infant or young child, resulting in physical injury to the head and/or its contents.” (AAP, 2015)

### Hallmark Injuries for AHT:

- Subdural hematomas with concomitant brain injury **AND**
- Retinal hemorrhages

Infants and children presenting with these hallmark injuries must maintain a high level of suspicion of AHT as these injuries are not always tantamount to abuse. The injuries when individually present are NOT specific for the AHT diagnosis. Additional spinal, skin, or skeletal injuries may or may not be present (AAP, 2015).

The diagnosis of AHT is often missed as the history of the injury is not provided, not known, or knowingly miscommunicated. Additionally, the signs and symptoms the child displays may be non-specific, such as vomiting, poor feeding, irritability or lethargy (Paul & Adamo, 2014 & AAP, 2015).

Children, with minor injury, may not receive medical care; many only receive medical care when they present with a severe or fatal injury (AAP, 2015).

### Did You Know?

**AHT is a serious and clearly definable form of child abuse.**

## Test Yourself

Which of the following statements about Abusive Head Trauma (AHT) are true?

- A. The hallmark of AHT is subdural hematomas and retinal hemorrhages**
- B. AHT can result from shaking and/or a blunt force injury**
- C. AHT is most common in children between the ages of 5 - 10 years
- D. AHT is seldom misdiagnosed

**Rationale:** Abusive head trauma (AHT), formerly known as shaken baby syndrome, is a violent injury to head caused by shaking, blunt impact, suffocation, or strangulation.

Small children are particularly vulnerable to such abuse because of the large disparity in size between them and an adult-sized perpetrator.

**Hallmark Injuries for AHT:** Subdural hematomas with concomitant brain injury **AND** retinal hemorrhages

## **Risk Factors**

Risk factors for child maltreatment have been categorized as intrinsic to the:

1. Child
2. Perpetrator
3. Family structure and society

(Paul & Adamo, 2014)

### **Child:**

The following factors increase the risk for infants and small children to AHT.

- Physical helplessness and dependency
  - Large heavy head
  - Weak neck muscles
  - A more pliable skull
  - Large fontanel and open sutures
  - High water content of the brain
  - Large subarachnoid space
  - Vessels bridging the space between the meninges and the skull are less tightly bound
- (AAP, n.d).

Other risk factors:

- Gender – no consensus, although boys tend to be injured more
- Race – no consensus, although black children have a higher risk of mortality
- Prematurity – higher risk for abuse

(Paul & Adamo, 2014)

### **Perpetrator:**

The following factors increase the risk that abuse may occur.

- Relationship to child
- Perpetrator was abused or abandoned as a child
- Young parents
- Female, although males are more likely to cause death by abuse
- Decreased self-esteem
- Depression
- Stress
- Unplanned or unwanted pregnancy
- Criminal activity

(Paul & Adamo, 2014)

### **Family Structure and Society:**

- Lack of community support
- Relationship issues

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- Alcohol or drug abuse
- Economic recession -rates and severity of abuse increase

(Paul & Adamo, 2014)

### **Did you Know?**

The American Academy of Pediatrics (2009) states that a normal infant spends approximately two to three hours each day crying and about one quarter to one third of infants cry even more than that; especially during the six week to four-month age group (which also coincides with the peak incidence of AHT).

Most instances of AHT occur because a parent or caregiver is frustrated or angry with a child, frequently when the child is crying. When a parent or caregiver shakes a crying baby, the baby may cease to cry because of the injury inflicted by the shaking. The caretaker may then associate such cessation with a gratifying response in that the infant ceases crying, causing the abuser to repeat the behavior (National Center on Shaken Baby Syndrome, 2010).

Caretakers at risk for abusive behavior generally have unrealistic expectations of their children and may exhibit a role reversal whereby caretakers expect their needs to be met by the child (National Center on Shaken Baby Syndrome (NCSBS), 2010).

### **Pathophysiology of AHT**

AHT, whether it has been caused by an impact or by a shaking mechanism, has the same pathological findings within the cranial cavity.

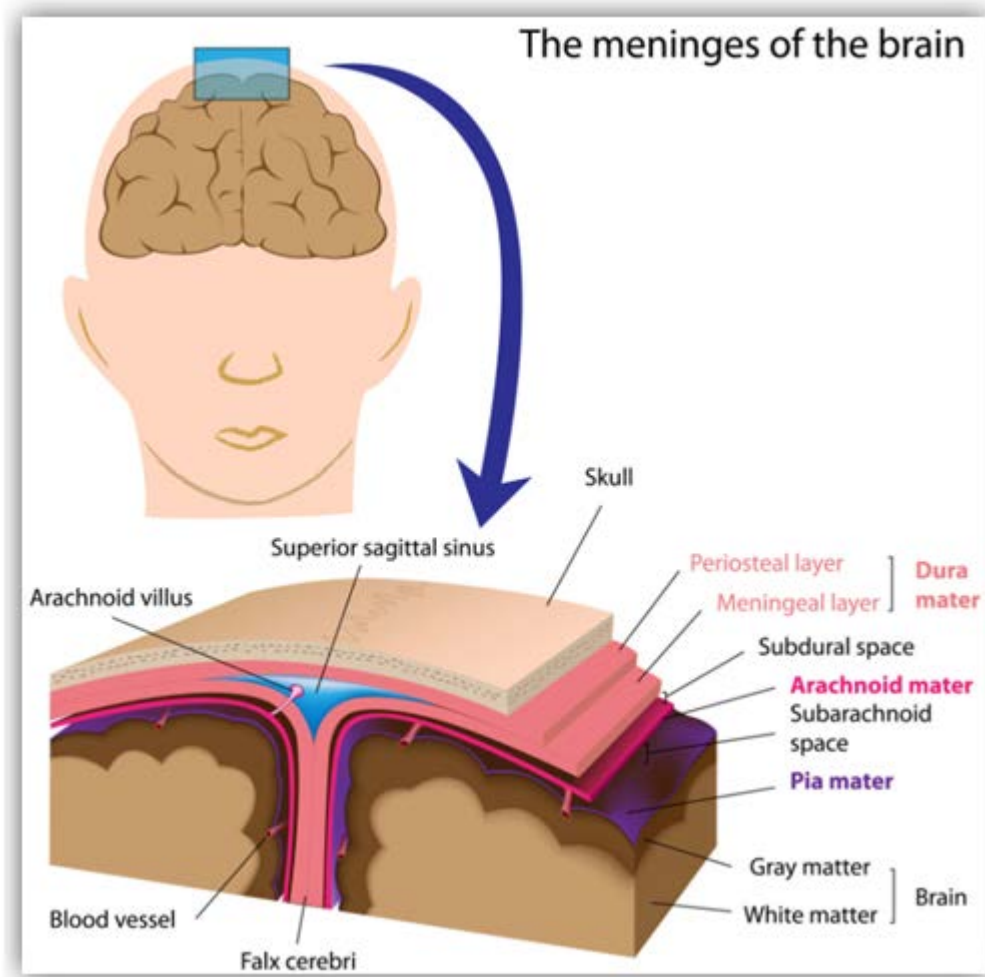
The location of intracranial bleeding is an important indicator of the mechanism of injury. Abusive head injuries can be categorized according to their location.

There are four types of abusive head injuries:

- Subdural hemorrhage
- Subarachnoid hemorrhage
- Retinal hemorrhage
- Diffuse axonal injury

### **Normal Anatomy**

It is important to recognize the normal structure of the cranial vault and the layers of meninges covering the brain to understand the mechanism and type of injuries that result from AHT.



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## Cranial Blood Vessels

It is important to note that the blood vessels supplying the surface of the brain are vulnerable to tearing when subjected to sudden head motion that overextends the vessels.

## Dura Mater Hemorrhages and Hematomas

Injuries involving the dura mater are categorized by the space above or below the dura mater (adhering to the skull). Hemorrhage and hematomas may appear in the epidural and subdural space.

Epidural hemorrhages/hematomas are caused by an arterial bleed and are located above the dura mater. This type of injury requires direct physical impact. Hemorrhages in the epidural space does not cross suture lines. These hemorrhages may be asymptomatic until brain structures are compromised; however, they progress rapidly and can compress the brainstem leading to unconsciousness and possibly death if not treated.

**Subdural hemorrhages/hematomas are associated with traumatic brain injury.**

Subdural hemorrhages/hematomas are caused by a venous bleed and are located below the dura mater and above the arachnoid (covering the brain). This type of injury does not require direct physical impact, but may result from abrupt deceleration (violent shaking of the head) results in tears in bridging veins which cross the subdural space. The resultant bleeding may cause an increase in intracranial pressure (ICP), which can cause compression of and damage to brain tissue. Subdural hematomas can be life-threatening, but have a better prognosis if properly managed.

Although subdural hematomas are classically crescent-shaped on a CT scan, they can appear convex in the early stage of bleeding. This may cause difficulty in distinguishing between subdural and epidural hemorrhages. A more reliable indicator of subdural hemorrhage is its involvement of a larger portion of the cerebral hemisphere since the bleeding can cross suture lines.

**On a CT scan, subdural hematomas are classically crescent-shaped, with a concave surface away from the skull.** Note: Blood is white on CT scans.

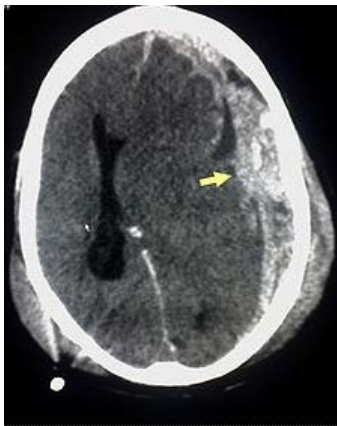


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### **Subarachnoid Hemorrhage**

Subarachnoid hemorrhages/hematomas are caused by arterial or venous bleeding and are located below arachnoid and above the pia mater.

Subarachnoid hemorrhage tends to be sparse and occurs in patches especially over the parasagittal cerebral convexities.

**CT scan showing subarachnoid hemorrhage as a white area in the center of the brain.**



Image provided courtesy of the GNU Free Documentation License.

### **Intraventricular Hemorrhage/Hematomas**

Intraventricular hemorrhage/hematomas are caused by subependymal veins are torn and the resultant blood fills the lateral ventricles.

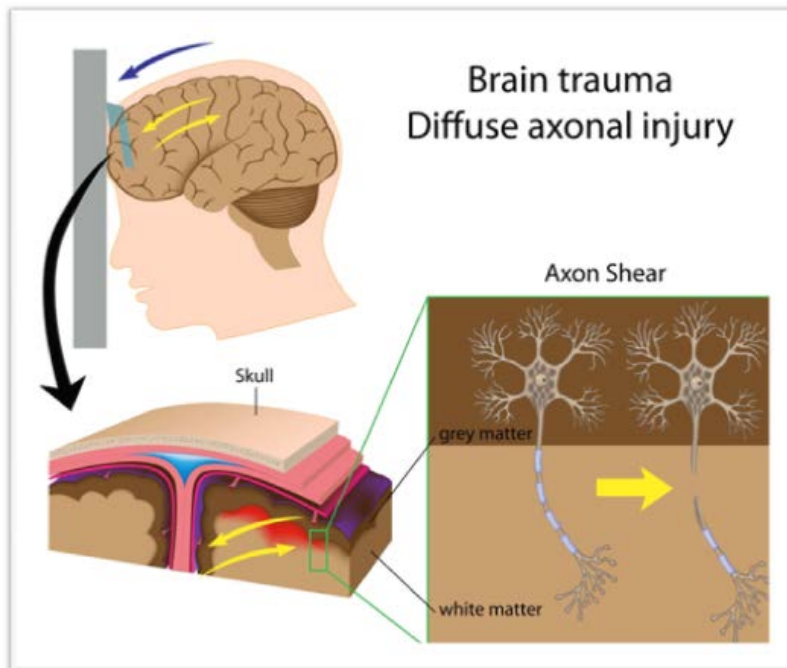
### **Traumatic Diffuse Axonal Injury**

Traumatic diffuse axonal injury results from sudden acceleration and deceleration of the brain tissue within the cranial vault. The abrupt movement of the brain when combined with a rotational force results in tears of axonal processes and small blood vessels in the brain.

When significant degrees of diffuse axonal injury occur, unconsciousness occurs.

Traumatic diffuse axonal injury implies widespread injury as opposed to a focal brain injury. On CT scan, traumatic diffuse axonal injury appears as extensive lesions in white matter tracts.

### **Image of traumatic diffuse axonal injury in head trauma.**



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## Retinal Hemorrhages

Retinal hemorrhages are very distinctive injuries, and are seen in 60 - 85% of AHT cases (Paul & Adamo). These injuries are often unilateral or bilateral, multilayered, subretinal, intraretinal, and preretinal, and would rarely be seen in any other ocular or systemic disease. Therefore, the presence of severe retinal hemorrhages is diagnostic of AHT (NCSBS, n.d.).

To confirm retinal hemorrhage (National Center on Shaken Baby Syndrome (NCSBS) recommends that an ophthalmology consultation be obtained in all cases in which AHT is suspected. Except in cases where a child's pupils may be fixed and dilated, the pupils should be dilated with ocular medication so that the entire retina can be examined. The ophthalmologist can also perform retinal photography for documentation purposes.

## Other Associated Injuries

Other injuries that can result from violent shaking include:

- Brain damage
- Hearing or speech impairment
- Cerebral palsy
- Behavioral disorders
- Seizures
- Damage to the eyes including possible blindness
- Potential delay in normal development including physical and learning disabilities
- Damage to the spinal cord such as paralysis
- Death

## Diagnosing AHT

The NCSBS (2010) recommends that healthcare professionals follow the following guidelines to facilitate the diagnosis of AHT.

- Be alert for the presence of bruises or abrasions on the faces or heads of children presenting non-specific symptoms.
- When evaluating infants and toddlers with non-specific symptoms, such as vomiting, fever, or irritability, consider head trauma in the differential diagnosis. Perform a head-to-toe physical examination, check the fontanelles on the babies' heads, measure the head size, and be alert for signs of trauma.
- When doing a spinal tap, look for signs of previous bleeding or old blood in the spinal fluid.
- Pediatric radiologists should be consulted to interpret radiographs and head CTs in cases of suspected child abuse.

## Signs and Symptoms

There is a wide spectrum of clinical presentations of abusive head trauma and may vary from mild and non-specific to severe and may include the following.

- Irritability
- Altered or decreased level of consciousness and lethargy
- Unequal pupils
- Inability to track with the eyes or focus attentively
- Inability to swallow or suck
- Poor feeding and/or vomiting
- Rigid or limp extremities (posturing)
- Bulging fontanelle or head that appears larger than normal
- Hypothermia
- Seizures
- Hypotension (late sign)
- Difficulty breathing\*
- Bradycardia\*
- Hypotension\*

\*Cushing's triad indicating intracranial hypertension

(NCSBS, 2010)

In cases that frequently result in severe injury or death, the child or infant will often become unconscious immediately and will have life threatening central nervous system impairment (NCSBS, 2010).

### **Did You Know?**

**An awareness of the signs and symptoms of abusive head trauma could increase the likelihood that more cases will be detected (NCSBS, 2010).**

### **Test Yourself**

Signs and symptoms of AHT include (choose all that apply):

- A. Irritability and poor feeding
- B. Seizures
- C. Bradycardia, hypertension, difficulty breathing
- D. Lethargy

Answer: All the above

Rationale: There is a wide spectrum of clinical presentations of abusive head trauma and may vary from mild and non-specific to severe

### **Diagnostic Tests**

Suspicion of AHT may be supported or confirms with the use of diagnostic testing.

#### CT scan:

- Obtained on admission and serially to identify and follow the evolution of hemorrhage and increased intracranial pressure and swelling.
- Confirm AHT by demonstrating damage to the brain tissue

#### Radiographs:

- Obtained on admission and serially to identify fractures
- May support AHT, especially when old or unhealed fractures are present

#### MRI studies:

- Considered to be complementary to CT scans since they are not as sensitive to identifying fractures and subarachnoid blood
- Some areas of the brain may be better visualized with MRI than CT

#### Laboratory studies:

- May support AHT and other injuries

### **Did You Know?**

**Occasionally, the comatose state may be unrecognized by caretakers or medical providers who assume that the infant is sleeping, lethargic, or suffering from a minor acute ailment or possibly an infection.**

## **Post Injury Care**

One of the most important points of care is not directly related to caregiving itself; it is reporting that abuse may have occurred. In most states, nurses and other professionals are mandated reporters. By law they must report any suspicion of child abuse to child protective services or the appropriate designated authority as soon as possible.

As with many pediatric illnesses or injury, AHT care is dependent on the severity of the injury. After a thorough work-up, care in the emergency department and at home may suffice for minimal injury; and admission to an acute care hospital ward may be needed for moderate injury. However, for the severely injured, admission to a pediatric intensive care unit is warranted. There the child can be treated by:

- A physician who can resuscitate and stabilize the baby immediately while diagnostic radiologic tests are being performed
- Specialists in pediatric radiology
- Pediatric neurology/pediatric neurosurgery
- Ophthalmology
- Pediatrician who specializes in child abuse

### Did You Know?

It is your responsibility to know the child abuse mandated reporting statutes of the state you are working in and how the facility you are working for enforces compliance to those statutes.

### **Outcomes**

AHT continues to be one of the top causes of death and disability in infants.

**1,200 to 1,400 children are shaken every year!  
25-30 percent die  
Permanent disability is prevalent in many survivors**

Permanent disability includes:

- Cerebral palsy
- Blindness
- Seizures

AHT results in:

- Mortality: 15-38 percent
- Permanent cognitive deficit: 50 percent
- Full recovery: 30 percent

The younger the child when the injury occurs, the more severe outcome.  
(Paul & Adamo, 2014)

### Did You know?

**Mild cases of AHT will have less severe injuries that could result in learning disabilities, behavior or personality problems, developmental delays or seizure disorders.**

### **Preventing AHT**

To help decrease the incidence of AHT, some states are beginning to enact mandatory training for caregivers to help in preventing this type of injury. Programs to enhance public awareness about AHT and other forms of child abuse should be directed at those individuals that have either been identified as high risk or able to influence the behavior of those at risk of committing the abuse.

Education of parents, family, healthcare providers, and community members is essential in the prevention AHT. This education should include:

- Parenting techniques
- Child development
- Nurturing
- Social support
- Social and emotional competence of children
- Mandatory reporting statutes
- Parental resilience strategies

(Childwelfare.gov, 2016)

**Note: As a part of anticipatory guidance, the nurse should ask about caretaker stress, discipline practices, substance abuse, and response to the crying infant (AAP, 2009).**

## Recommendations for Healthcare Professionals

The American Academy of Pediatrics recommends that healthcare professionals:

1. Become educated about the recognition, diagnosis, treatment, and outcome of shaken baby and abusive head-impact injuries in infants and children.
2. Be aware of and exercise their responsibility to report these injuries to appropriate authorities.
3. Provide pertinent medical information to other members of multidisciplinary teams investigating these injuries.
4. Support home visitation programs and any other child abuse prevention efforts that prove efficacious.
5. Provide or have appropriate referrals to resources to educate parents about healthy coping strategies when dealing with their child.

(Committee on Child Abuse and Neglect, updated 2009 & 2013)

Caring for victims of AHT can be especially challenging for healthcare professionals.

Feelings of grief toward the victim and anger toward the perpetrator may be difficult to control; however, the caregiver must not allow this to affect their ability to provide quality nursing care to the patient or immediate family.

Since it is not unusual for healthcare professionals to experience sadness or depression related to the tragedy of shaken baby syndrome or other cases of abuse, many facilities will provide debriefing or counseling for staff (NCSBS, n.d.).

### *Please note!*

**For additional abuse legislation and reporting, please visit RN.com's course: A Nurse's Guide to Child Abuse.**

### **More Info**

**State Central Register of Child Abuse & Maltreatment**

**1-800-635-1522**

## **Case Scenario:**

Jonathon, a 9 month-old male is brought to the ED by his aunt, who cares for him during the week,

when his mother is at work.

On admission the following findings are evident:

- HR: 185
- RR: 60
- Capillary Refill Time: More than 3 seconds
- Weak pulses
- Anterior fontanel firm and bulging
- Retractions & nasal flaring
- Pale mucus membranes in the mouth.
- Retinal hemorrhage noted in right eye

Normal assessment findings for a baby (birth - 1 year)

- Respiratory Rate: 24-40 breaths/min
- Heart Rate: 90-130 beats/min
- Capillary Refill Time: 2-3 seconds

**You are the emergency department nurse in a small facility, what do you know from your assessment?**

1. Jonathon is in respiratory distress (elevated RR, increased work of breathing)
2. His cardiac output is diminished (elevated HR, poor perfusion)
3. Firm and bulging fontanel (need more information, is he crying or quiet?)
4. Retinal hemorrhage (need more information)

**What should you anticipate doing for Jonathon?**

1. Application of oxygen using whatever device causes less distress for Jonathon
2. Talking with Aunt for an in-depth history, especially for fluid intake, urine output, injury

The physician evaluates Jonathon who is now very lethargic and flaccid. He suspects AHT because the fontanel remains bulging despite his lethargy and the presence of retinal hemorrhages.

**What orders do you anticipate receiving?**

1. Radiography: CT of the head and skull and chest radiographs
2. Laboratory studies
3. Consults: Neurosurgery, Ophthalmology

The results of the radiographs show:

CT results:

1. Subarachnoid hemorrhage
2. Intraventricular hemorrhage
3. Intracranial swelling

Skull radiograph results:

1. No skull fractures

Chest radiograph results:

1. Old fractures on several ribs

**Based on these results what diagnosis do you anticipate?**

The physician will most likely diagnosis AHT and recurrent physical abuse based on the rib fractures

**What next steps do you anticipate?**

1. Mandatory reporting of the suspected abuse
2. Transport to the nearest pediatric intensive care equipped to care for this child

## **Conclusion**

AHT can occur when an infant or toddler is physically abused either by direct impact or severely shaken. Severe cases can result in life threatening injuries or death.

Providing educational opportunities for healthcare providers, the community and families and caregivers will help in AHT prevention.

Healthcare professionals should be familiar with the signs and symptoms of this potentially lethal form of child abuse inflicted upon one of the most vulnerable groups of individuals: infants and small children.

**AHT is a clearly definable medical condition.**

**Greater attention and resources should be devoted to prevention of abusive injuries.**

## **Resources**

### **National Center on Shaken Baby Syndrome**

2955 Harrison Blvd, #102  
Ogden, UT 84403  
(888) 273-0071  
[www.dontshake.com](http://www.dontshake.com)

### **Parents Anonymous®, Inc.**

675 West Foothill Blvd., Suite 220  
Claremont, CA 91711-3475  
(909) 621-6184  
[www.parentsanonymous.org](http://www.parentsanonymous.org)

### **Shaken Baby Alliance**

4516 Boat Club Rd., Suite 114  
Ft. Worth, TX 76135  
(877) 6-END-SBS  
[www.shakenbaby.org](http://www.shakenbaby.org)

### **Shaken Baby Syndrome Prevention Plus**

649 Main St., Suite B  
Groveport, OH 43125  
(800) 858-5222

## Shaken Baby Syndrome

American Humane is a nonprofit organization dedicated to protecting children and animals from abuse, neglect and exploitation.

For more information or to lend your support, please visit [www.americanhumane.org](http://www.americanhumane.org) or call (800) 227-4645.

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